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ABSTRACT

Seychelles Integrated Science (SIS), a 3-year laboratory-based science program for students (ages 11-15) in upper primary grades 7, 8, and 9, was developed from an extensive evaluation and modification of previous P7-P9 materials. This P7 SIS unit focuses on: (1) the structure of the two main soil types in Seychelles; (2) the role of roots in plant growth; (3) the concept of the cellular nature of living things; (4) benefits of having earthworms in soil; (5) separating soil samples; and (6) the behavior of snails and the damage to agricultural crops caused by these animals. Provided for the unit is a student workbook and a set of teaching notes. The teaching notes include the general aims of the unit and a lesson plan for each topic area. Each lesson plan includes a suggested time frame, a list of objectives, a list of equipment needed, and a suggested lesson format. This format includes suggestions for introducing the lesson, instructional strategies (emphasizing procedures for student activities), and evaluation methods. The student workbook includes procedures for completing the unit activities and a list of new words keyed to page numbers in the workbook. (JN)

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seychelles integrated science

Unit 4

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TEACHING NOTES

CONTENTS

The Goals of Unit 4 -----	Page 1
Background Reading -----	Page 2
Topic 1 --- Studying the Soil -----	Page 3
Topic 2 --- Different Types of Soil -----	Page 7
Topic 3 --- Looking at Plants -----	Page 12
Topic 4 --- Plants Roots -----	Page 16
Summary 1 --- Living Cells -----	Page 20
Topic 5 --- Looking at Snails -----	Page 24
Project 1 --- The Wormery -----	Page 28
Topic 6 --- Looking at Earth-worm -----	Page 30

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Goal 1 - Unit 1

In Unit 1, we look at the structure of the two main soil types in Seychelles. We look at the structure of the two main soil types and note which crops prefer each type. We look at plant structure, particularly at roots, and then introduce the idea that plants and animals are cellular in nature. Finally we investigate the appearance and behaviour of the animals that live in or on the soil - a pest (the snail) and a "friend" (the earth worm).

The Unit has five main goals:-

- (1) To develop the pupil's understanding of the structure of the two main soil types in Seychelles.
- (2) To develop in the pupils an understanding of the role of roots in plant growth.
- (3) To introduce the pupils to the concept of the cellular nature of living things.
- (4) To foster in the pupils an awareness of the benefits of having earth-worms in the soil.
- (5) To foster in the pupils an awareness of the damage done by snails to agricultural crops and to develop their understanding of the behaviour of snails so that they can better appreciate how to control them.

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Background Reading

Before teaching this Unit we suggest you read the following pages in "Reprints of Agrinews" and "General Agriculture and Soils". Both books should be available in your school. If not please contact the Science Section of N.I.P.

Reprints of Agrinews.

Page 3 - 5

Page 23 - 25

Page 79 - 281

General Agriculture and soils

Page 53 - 56

The readings are for your background information to help you teach the Unit. We do NOT expect the pupils to cover the content to the same depth. The objectives showing the standard the pupils should achieve are given in this Teacher's Guide.

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LESSON

Unit 4

Topic 1

Studying The Soil

Time

Three to four periods

Objectives

At the end of the Topic the pupils should:-

- (1) Know that soil contains air.
- (2) Be able to carry out an activity, using a jar, water and a sample of soil to show the clay, silt, sand, gravel and humus in that soil.
- (3) Be able to explain in their own words that the humus in a soil is made from bits of dead plants and animals.

Equipment

Each group of pupils will need:-

- Two different soil samples.
- Two jars or beakers. (gas jars will serve best)
- A hand lens.
- A plastic bag or beaker (to collect the soil in).

You will also need a trowel or small spade and an empty shell.

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Suggested Lesson Format

Introduction

Allow each group to look at and feel a sample of soil. Ask the pupils "where does soil come from?" and "what is it made of?" Allow a few to suggest ideas.

Activity

Bring the class outside to collect one or two soil samples for each group. Try to collect them from a number of different places, e.g. under a bush and near a path.

Back in the classroom let the pupils read Section 1.1 and then feel and look at the different samples. Ask each group to think of a statement about each soil sample. More able pupils should write their descriptions into their books.

Let each group read Section 1.2 and 1.3. Ask one or two pupils to describe what they are going to do and then let each group carry out the activity. Move around from group to group asking them to describe what they see as they drop the soil into the water. Get each group to bring out the idea that there is air in the soil. If any group fails to realize this remind them of what happened when they dropped an empty shell into water in Topic 1 of Unit 2. Drop a shell into some water to help remind them (objective 1).

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Get each group to prepare a label giving their names and saying where each sample of soil came from. Then leave the soil samples somewhere where they won't be disturbed until the next lesson.

In the next lesson get each group to look at one of their samples. You and the technician should move from group to group asking them to describe what they see and what they think each layer is.

Draw a diagram of one soil sample, as it is in the jar, on the board and introduce the words gravel, sand, silt and clay. Bring out the point that the larger the particle the heavier it is and the nearer the bottom it is.

Ask the pupils to pick out and look carefully at some of the particles floating on the surface. Ask the pupils to look at these with the hand lens and say what they are. Introduce the word humus as the name for dead pieces of plants and animals that we find in soil. (objectives 2 and 3).

Discussion and Evaluation

Ask the pupils to draw and label their own diagram of the soil and water in a jar. Get each group to prepare a short verbal statement of what they did and what happened when they added the soil to water. Check each group's verbal statement. Have the pupils say then write up their own statement.

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For pupils who have problems with English,
choose one of the group's statements and
write this on the board for them to copy
into their books.

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LESSON

Unit 4

Topic 2

Different Types of Soil.

Time

Three to four periods.

Objectives

At the end of this Topic the pupils should:-

- (1) Be able to explain in their own words the difference between a sandy soil, a clay soil and a loam.
- (2) Be able to carry out an experiment to demonstrate that a given soil sample contains water.
- (3) Be able to carry out an experiment to find out which of two soil samples will retain most water.
- (4) Know that some plants, such as coconut grow best in sandy soils while others, such as yam, banana and cassava, grow best in red soils.
- (5) Be able to explain in their own words that we can improve (sandy) soils by adding humus to them or by covering them with straw or dead leaves to reduce water loss.

Equipment

Each group of pupils will need:-

- A burner and tripod stand
- A crystalizing dish and watch glass
- A measuring cylinder and filter funnel
- An empty matchbox
- Four soil samples, two of which should be "sandy" and two should be "red" soil.

You should have a pot plant which has not been watered for 3 or 4 days.

Introduction

Let each group look at two soil samples (one sandy and one "red" soil). Ask them to feel the difference between the two. Allow each group a few minutes to prepare a statement to describe the difference and then let them explain their description to the class

From the class discussions bring out the point that if a soil contains a lot of sand (50% or more), we call it a sandy soil. If it contains a lot of clay (50% or more), we call it a clay soil. A loam is a soil which contains a good mixture of sand and clay - less than 50% of either. (objective 1).

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Activity

Get each group to read and discuss Section 2.1 and 2.2. Ask one group to demonstrate to the others what they will do. Allow some discussion and then when you are sure that everyone understands the instructions let the groups carry out the activities.

As they finish ask each group to prepare a verbal statement describing the results they got from the two soils. Let two or three groups report on their results. Choose the best statement and write it on the board. (objective 2).

Ask the pupils what will happen to a plant if it can not get water. Allow a few pupils to make suggestions and then bring out the pot plant which has not been watered. Explain that this is what is likely to happen to a plant which is in sandy soil when there is little rain. Ask if anyone can suggest a way to stop sandy soil "drying out".

From the discussion bring out the suggestion that just as in the experiment we covered the dish with a watch glass to "trap in" the water we can also cover soil to trap the water.

Explain how we can cover the soil with dead leaves or straw to help stop the water in it from evaporating - we call this mulching (ANPAYE)-or else dig in extra humus to hold water. (objective 5)

Explain that the "Red" soil we have in Seychelles is a loam it has both sand and clay in it. Some plants grow better in red soil some grow better in sandy soil. Ask the pupils to read Section 1.1 and to work with a partner to decide which soil they think each of the four plants listed will grow best in.

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Draw a table on the board. Let each pupil copy and complete it into their books.

Plant	Likes
Coconut	----->Soil
Yam	----->Soil
Banana	----->Soil
Cassava	----->Soil

Mark the pupils work and allow some discussion for pupils to say why they answered as they did. Then complete the table on the board.

Coconut ----->Sandy soil

Yam, banana and cassava ----->Red soil

Let each group read Sections 2.5 2.6 and 2.7. Then allow them a few minutes to plan what they are to do. Ask one group to explain and demonstrate what they intend to do. Ask a number of individuals to say what they think will happen and why they think so. Then let each group carry out the activity.

Discussion & Evaluation

Draw two sets of the apparatus for activity 2.5 on the board. Label one "Sandy soil" and the other "Red soil". Get the pupils to copy these diagrams into their books.

With more academically able classes allow each group a few minutes to prepare a verbal statement.

Let them report on their statement and then using key words from the board let each pupil write out one of the statements.

For lower stream classes write a paragraph on the board and ask the pupils to 'fill in the missing words'. At this stage try to get them to fill in double words such as 'sandy soil' or 'measuring cylinder'.

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LESSON

Unit 4

Topic 3

Looking at Plants

Time

Three to four periods

Objectives

At the end of the Topic the pupils should:-

- (1) Be able to identify on a plant, or a drawing of a plant, the leaves, stem, roots, buds and flowers.
- (2) Show a plant or a drawing of a plant be able to identify whether or not it has tap roots or fibrous roots.
- (3) Be able to explain in their own words that most MONOCOT plants have narrow leaves with parallel veins and fibrous roots, while most DICOT plants have wide leaves with net veins and 'tap' roots.
- (4) Be able to identify tomato, coconut, pepper, sugar cane, mango, maize and breadfruit plants as being either Monocots or Dicots.
- (5) Be able to recall 3 Monocot plants and 3 Dicots.

Equipment

Each group of pupils will need:-

- Use of a trowel
- A jar
- A small plant such as 'lerb sat' or balgam
- Some drops of food dye
- A grass plant
- A beaker

You should be prepared to show the pupils as many of the following plants as possible
tomato, coconut, pepper, sugar cane, mango,
maize and breadfruit.

Suggested Lesson Format

Introduction

Ask the pupils if they can name anything which lives in the soil. Allow one or two to make suggestions and then ask each pupil to try and think of as many different things as they can that live in soil.

Use the pupil's suggestions to write a list on the board.

Activity

Bring the class outside to look for and collect a number of small plants.

While collecting the plants discuss with the pupils the names of the different parts of plant see objective 1.

Back in the class room get each group to wash the soil off the roots and then to set up the plant in a jar or beaker. Let each group add two or three drops of a red or blue food dye into the water in the jar.

Get each pupil to draw a diagram of the group's plant into his/her book. Then ask each pupil to label the stem, root, leaves, bud and flower. You and the technician should move around from pupil to pupil checking that they can do this (objective 1)

Bring the class outside again to collect some grass plants. Let them bring these into the laboratory and set them up in a beaker of water. Again let them draw their plant and label the roots and leaves.

Ask each group to look at the roots of their two plants and to prepare a short (verbal) statement on what each looks like. Let the groups report and then write the best report on the board. Introduce the words 'tap root' and 'fibrous roots' to label the pupils two descriptions.

Now ask each group to take one leaf from each of their plants. Ask every pupil to look at the two leaves and then ask each group to prepare a (verbal) description of the two leaves. Let each group report. During the discussion of the reports introduce the words MONOCOT and DICOT and introduce the ideas of narrow leaves, parallel veins and broad leaves with veins like nets.

Let the pupils read Sections 3.4 and 3.5. Now ask each group to prepare a statement explaining in their own words the difference between a MONOCOT and DICOT. (Objectives 2 & 3) Write the best statements on the board.

Bring the pupils outside and show them as many different Monocots and Dicots as possible. Ask individual pupils to say whether or not the plants are Monocots or Dicots and to explain why they say so. (objective 4)

Discussion & Evaluation

Back in the classroom ask the pupils to name 3 plants which were monocots and 3 which were dicots. Write the names on the board.

Check the pupils achievement of objectives 1, 2 and 3 by asking individuals to label or identify different parts of plants from drawings on the board. Finally get each pupil to write a report about monocots and dicots. With weaker classes rub out some of the words in the 'statements' that are on the board and ask them to complete these.

Make sure the pupils keep their dicot plants in the coloured water. They will need them for Topic 4.

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LESSON

Unit 4

Topic 4

Plant Roots

Time

Three to four periods

Objectives

At the end of the Topic the pupils should be able to:-

- (1) Describe in their own words that banana plants have small short roots.
- (2) Explain in their own words that roots hold plants in the ground and support them to stop them falling.
- (3) Explain in their own words that when removing weeds from soil we must remove their roots or else the weeds will grow again.
- (4) Use a microscope to look at a thin section of a root or stem.
- (5) Explain in their own words that roots take in the water which plants need to live.

...17/

Equipment

Each pair or group of pupils will need:-

- A microscope and slide
- Use of a blade or sharp knife
- A dicot plant (from topic 3)

Be prepared to show the class a paw paw and a banana plant.

Suggested Lesson Format

Introduction

Bring the class outside and ask them look to see if they can see the roots of any plants. Allow them a few minutes to find some roots that have broken through the surface of the soil.

Activity

Now find the paw-paw plant and scrape off the soil to find the roots and show how well spread they are. Find the banana plant and again scrape off the soil to expose the roots. Note how small and short the roots of the banana plant are. Cover up the roots of both plants. (Objective 1)

Now ask each pupil to find a piece of grass and to pull on its leaves. Ask them why is it difficult to pull the plant out of the soil. Bring out the idea that the roots are holding it in.

Ask the class which plant would be easiest to pull out of the soil - a paw-paw or a banana plant. Allow some individuals to answer and to give reasons for their answers. (Objective 2.)

Pull the leaves off a grass plant and then ask the pupils if you have 'destroyed' or killed the plant. Allow a few pupils to make suggestions then use the trowel to show that the roots of the plant are still in the soil and can grow again.

Bring the pupils to the Agriculture plot and ask them to 'pluck out' some of the weeds. Let them show you how to do it - demonstrating that they pull out the roots of the weeds. (objective. 3)

Back in the laboratory get each pupil to read sections 4.4 to 4.6. Let one group demonstrate to the others what they intend to do. Allow the others to watch and to criticize. When you are sure each group can follow the instructions let them carry out the activity with the root.

You ~~and~~ the technician should move from group to group checking that they can carry out the activity. Make sure each group gets a THIN section of root. Ask them to draw, what they can see through the microscope, into their books. Point out that the red stain is where the coloured water has passed through the root.

Let each group now look at a thin section of stem and again draw what they see into their books.

Get the pupils to cut across the stalk of a leaf to see if they can see any red colour or stain in the stalk.

Some pupils may be able to cut a section of a leaf thin enough to look at through the microscope but don't insist on this. It will be too difficult if the blades or knives are not really sharp. (objective. 4.)

Discussion & Evaluation

Allow each group a few minutes to discuss what they have done and then let them report on what they have seen. Let one or two groups draw what they have seen on the board.

From the discussion bring out a statement about roots taking in water from the soil for the plant. (objective 5)

With more academically able classes get them to write one or two sentences about the 'jobs that roots do'. With weaker classes you may prefer to write one or two sentences on the board which the pupils need to complete for themselves.

'Roots hold ----- in the soil and stop them from ----- . Also take in ----- from the soil'.

falling, plants, roots, water.

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LESSON

Unit 4

Summary 1

Living Cells

Time

About two to three periods

Objectives

At the end of the summary the pupils should:-

- (1) Know that all living things are composed of cells.
- (2) Be able to take a layer of cells from an onion and look at it through a microscope.
- (3) Be able to scrape cells from their cheeks and look at them through the microscope.
- (4) Be able to identify the nucleus in a stained cell or a drawing of a stained cell.

More academically oriented pupils should also:-

- (5) Be able to make a squash preparation of an onion root tip in order to see the cells in the root through the microscope.

Equipment

Each pair or group of pupils will need:-

- A microscope
- Two microscope slides
- A piece of onion
- A few drops of methylene blue solution
- A teat dropper for water
- A clean spatula
- A sheet of paper.

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With more academically able classes or groups you will also need two or three onions which have been growing on top of a jar of water for 1 to 2 weeks.

Suggested Lesson Format

Introduction

Ask the pupils if anyone has ever seen a 'block' house being built. Let one or two describe how it is built. From their description bring out the point that the house is made - or built up - from lots of blocks added together.

Now ask the pupils if anyone knows how animals and plants are made - could they be built up of tiny blocks added together? Allow a few minutes for discussion.

Activity

Demonstrate to the pupils how to take a thin section or layer from a piece of onion and set it on a microscope slide and add one or two drops of water to it.

Let each group carry out this activity and observe the onion cells. Move around from group to group making sure they can focus the microscope and have observed the cells. Show the groups how to increase the magnification.

Ask one pupil from each group to draw what he or she can see on a sheet of paper. Draw a view of a group of cells on the board and introduce the word CELL as the building block that all living things are made of. (objective 1 & 2).

Explain and demonstrate how to take a scraping of cells from your cheek with a clean spatula. Allow the groups to read and then carry out activity 3. Move around from group to group checking that they can do this. (objective 3)

Again let one person from each group draw what they can see. Then draw a diagram on the board. Do not worry about the difference between plant and animal cells. Show each group how to stain their cells with one or two drops of methylene blue solution. Let them look again at the cells to identify the nuclei in the cells.

Ensure that everyone in the class sees stained cells with nuclei in them. At this level you need only introduced to nucleus as the bit that controls the rest of the 'cell' - 'the brain of the cell'. (objective 4)

Discussion & Evaluation

Allow each group a few minutes to discuss 'what we have learned today.' Let each group prepare a statement and then let each group report on its statement.

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All classes should copy and label the two drawings of onion and cheek cells into their books. More able pupils should then write up their own statement. With less able classes you may need to help them by writing out one group's statement on the board.

With more academically able classes or groups you should extend this lesson to let the pupils look at the cells in an onion root tip.

Let each group cut about 1cm off a root tip. Place it on a microscope slide and then place a second slide on top. They should then gently but firmly - squeeze the two slides together. Remove the top slide and add one or two drops of methylene blue solution. After waiting a minute they can then add 5-6 drops of water.

They should now be able to see the cells of the root tip through a microscope.

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LESSON

Unit 4

Topic 5

Looking at Snails

Time

Three to four periods

Objectives

At the end of the Topic the pupils should:-

- (1) Know that snails are pests because they eat many crops that we plant.
- (2) Be able to carry out an experiment to find out whether snails prefer light or shade.
- (3) Be able to explain in their own words how a snail will behave if it touches salt.
- (4) Be able to explain in their own words how we can protect crops with snail pellets.

Equipment

For this Topic each group of pupils will need:-

- A beaker
- Some snails
- Some leaves to feed the snails
- A basin or bowl and a cover for it
- A little salt
- Some snail pellets
- Some soil and a plant

Suggested Lesson Format

Introduction

You can 'introduce' this lesson by letting the pupils simply look at and talk about their snails. How many they got? Where they got them? Who has the biggest? etc.

Activity

Have two or three snails placed in a beaker with some leaves for each group. Ask the pupils to look at them carefully and to draw a picture of one of the snails. Allow about 15 - 20 minutes for this. You and the technician should move around from pupil to pupil discussing the drawings.

Ask each group one or two questions about snails. For instance, 'where do they live?' 'What do they eat?' and 'Why do they climb walls?'

From the discussions bring out the point that snails are pests because they eat and damage good crops (Objective 1)

Ask where you are most likely to find snails during the day.- in the shade or in the light? Then ask how could we check in the lab whether 'our' snails prefer the dark or the light. Allow each group a few minutes to discuss how they could find out. Then let each group report on their suggestions. Use the different suggestions to plan an experiment and outline to the pupils what they should do.

Let each group set up and carry out activity 5.3. (Objective 2.)

Let the pupils read section 5.4 and test to see how the snails react to salt in front of them. Ask each group to report on what happens. (Objective 3.)

Ask the class 'should we protect crops with salt?' Allow three or four pupils to reply and in the discussion bring out the points that; salt will 'dissolve' and wash away easily, it may damage the plants and would be expensive to spread around every plant. Show the pupils the snail pellets and ask has anyone ever seen or used them.

Let each pupil read section 5.5. Allow each group a few minutes to plan and discuss what they will do and then let them carry out the activity.

Discussion and Evaluation

Leave the snails overnight. Then in your next lesson get each group to prepare a verbal report on what happened in their experiment. (Objective 4)

Make a summary of the Topic with the class bringing out the four objectives of the lesson, with the results of the experiments.

Write the key words of the summary on the board and then get the pupils to use this to write their own report on snails. Try to encourage the weaker classes to write some sentences of their own or get them to complete sentences.

- 27 -

e.g.

'Snails are ----- which eat our f-----
c-----.'

'We tested some snails to see if they liked
----- or ----- best. We found
they liked the -----.'

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...28/

LESSON

Unit 4	Project 1
The wormery	
Time	One to two periods
Objectives	At the end of the Project the pupils should:- (1) Know that earth worms live and burrow in soil. (2) Know that earth worms get their food by eating pieces of humus. (3) Be able to set up a wormery and observe it over a period of two weeks and make records of their observations.
Equipment	Have three or four wormeries ready with about four large worms for each. You will also need some dead leaves or humus.
Suggested Lesson Format	
Introduction	Introduce the lesson by letting the pupils look at the worms they have brought in. (Arrange with the technician to have some extra ones just in case they are needed.) Ask the pupils questions about worms - 'Where do they live?' 'What do they eat?' 'Can they see?' (Objective 1)

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Activity

Let everyone read sections 1 and 2. Allow each group to set up their wormery and then to draw a diagram of it into their books.

Draw a results table on the board and let each pupil copy the blank table into their book.

Explain to the groups how and when you want them to make their observations on the wormery.

Now let each group 'add in' its worms to the wormery and watch what happens for 5 - 10 minutes.

Discussion and Evaluation

Ask each group to prepare a (verbal) report on what they observed. Let the groups present their reports and then use these to produce a short 5 - 10 word summary.

Write the date and then complete the observations column in the table using the short summary. Let the pupils copy this into their own table and then explain to them how and when they should complete the rest of the observations. (Objectives 2 & 3)

LESSON

Unit 4

Topic 6.

Looking at Earth-worms

Time

Three to four periods

Objectives

At the end of the Topic the pupils should be able to:-

- (1) Explain in their own words that worms have tiny hairs or bristles underneath their bodies to help them move.
- (2) Draw a diagram of a worm and label it to show the mouth, saddle, segments and anus.
- (3) Plan and carry out an experiment to see if worms prefer light of darkness.

Equipment

- Each pair of pupils should have a large earth-worm, a hand lens and a beaker.
- Each group should also have a box or basin, and cover for it.

Suggested Lesson Format

Introduction

Let each group look at its wormery. Point out any burrows that have been made and then ask how can the worms move through the burrows. 'How do they move along?' 'Have they any legs?'

Activity

Let everyone read sections 6.0 and 6.1 then give each pair of pupils a worm and a hand (lens).

Ask them to watch the worm moving. Ask if anyone could show the class how a worm moves. Allow one or two pupils to 'crawl' like a worm. Ask the rest of the class if they are moving like the worm.

Let everyone read section 6.2 and then try the activity. (Objective 1.)

Move from group to group and ask the pupils in each group to point out on their worm the mouth, saddle, segments and anus.

Put the worms back into their beakers and then ask the pupils to draw and label a picture of 'their' worm. You and the technician should move from pupil to pupil checking their work. (Objective 2.)

Ask the pupils if they remember the experiment to test a snail to see if they preferred light or dark. Ask could we test worms in the same way.

Allow each group a few minutes to plan and discuss what they are going to do.

Let each explain to you or the technician what they plan.

You should also ask each group what they 'expect' or think will happen - 'will the worms prefer light or dark?' Ask the pupils to say why they have chosen their answer.

Let each group carry out the activity. (Objective 3.)

Discussion & Evaluation

Ask each group to prepare a (verbal) report on what happened in their experiment. Let them report to the class.

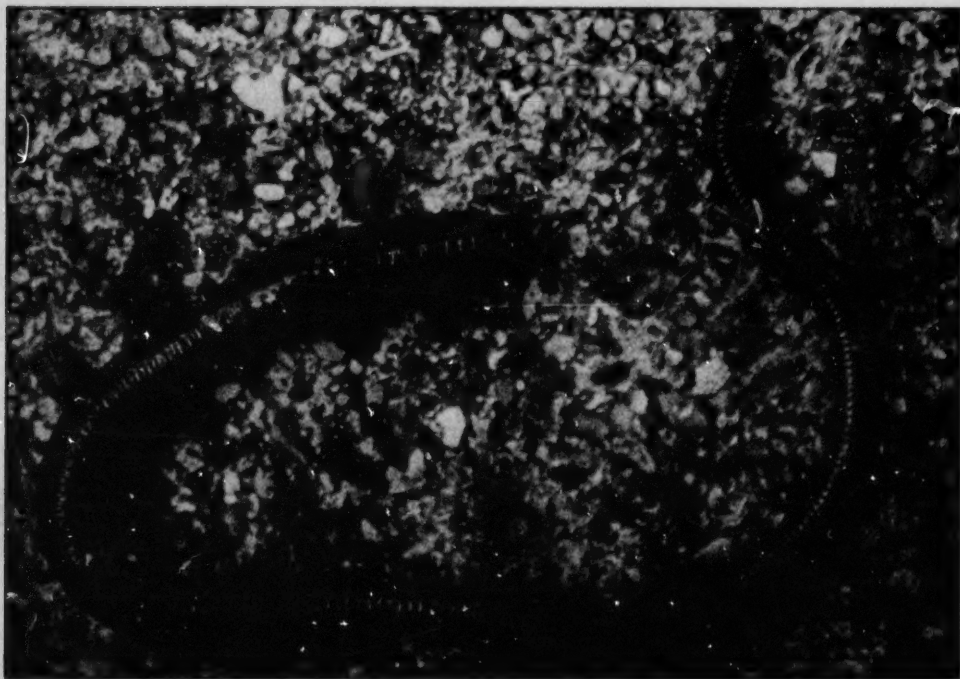
More able pupils should be able to write up their own reports. Lower classes may need to complete one of the reports that you have written in outline form for them.

'We put an earth-worm into a ----- . We covered one side of the box with a ----- . Then we put a worm in the ----- of the box so that half of it was in light and the other half was in the ----- . The worm moved to the ----- side'

light, box, middle, dark, cloth, dark, water, side.

**SEYCHELLES
INTEGRATED
SCIENCE**

Unit 4



SOIL AND LIVING THINGS

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CONTENTS

TOPIC 1	STUDYING THE SOIL	PAGE 1 - 2
TOPIC 2	DIFFERENT TYPES OF SOIL	PAGE 3 - 4
TOPIC 3	LOOKING AT PLANTS	PAGE 5 - 6
TOPIC 4	PLANT ROOTS	PAGE 7 - 8
SUMMARY 1	LIVING CELLS	PAGE 9
TOPIC 5	LOOKING AT SNAILS	PAGE 10 - 11
PROJECT 1	THE WORMERY	PAGE 12
TOPIC 6	LOOKING AT EARTHWORMS	PAGE 13 - 14

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THE MINISTRY OF EDUCATION AND INFORMATION

REPUBLIC OF SEYCHELLES

STUDYING THE SOIL

- 1.0 You have probably heard people talk a lot about the SOIL. Soil is the name we give to the ground where plants can grow. Discuss what you already know about the soil with your friends and with your teacher.
- 1.1 Go outside to collect some samples of soil from different places, for example: under a bush, near a beach, a path, the school agriculture project.....

Look carefully at each sample through a special piece of glass called a HAND LENS. Feel each sample between your fingers. Write one or two lines in your book to describe each of your samples.



- 1.2 Pour some water into a jar until it is about half full. Put some soil (from one of your samples) into the water, and watch what happens. Then put in some more soil until the jar is about $\frac{3}{4}$ full. Stir the soil around with a spatula.

Do you think that there was air in the soil ? How do you know ?

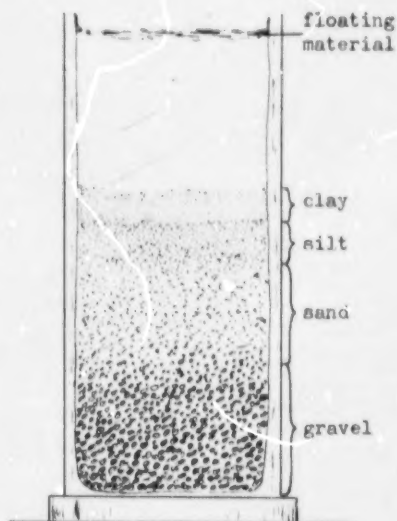
- 1.3 Repeat experiment 1.2 with the other samples of soil, each in a separate jar. Label the jars and leave them to stand until your next science lesson.

STUDYING THE SOIL

- 1.4 Soil contains very small bits, or PARTICLES, of rock. Some of these particles are very fine, like dust. Others are larger, like gravel (2 mm wide or more).

Look at the jar of soil from under a bush. You will see that the largest particles, of gravel, settle at the bottom first. Slightly smaller particles of sand settle next, followed by even smaller particles, of silt, and then finally the smallest particles of clay.

Now look at some of the other jars. Which of your samples of soil contains the most gravel? Which contains the least?



- 1.5 Use the diagram on the right to help you to make a drawing of what you can see in one of your jars. Below your drawing, write a few lines to describe what you can see in the jar.
- 1.6 Now look carefully at the "floating material" in the jars. Write down what it looks like, and where you think it comes from.

This floating material usually contains bits of dead leaves, roots and so on. We call it HUMUS. Which of your samples of soil contains most humus? Which contains the least? Try to suggest reasons for this.

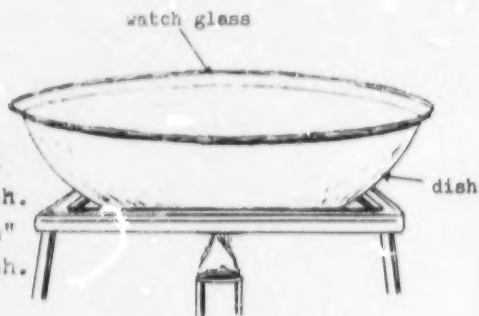
LEAVE THE JARS TO STAND UNTIL YOUR NEXT SCIENCE LESSON

DIFFERENT TYPES OF SOIL

- 2.0 In Topic 1, we studied samples of soil from different places. All of these soils contain many particles of different sizes. We say that a soil is a "sandy soil" if it has very little clay in it, but a lot of sand (50% or more). A "clay soil" contains a lot of clay (50% or more). The best soil for growing plants has a mixture of clay and sand, which we call a loam soil.

- 2.1 Now we shall try to find out more about different types of soil:

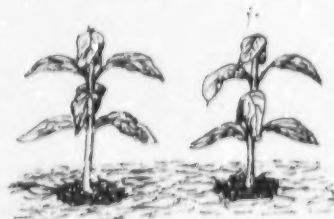
Choose the sample of soil that contains the most clay. (Look at your results from Topic 1.4 to help you). Put some of this soil into a dish. Cover the dish with a "watch" glass. GENTLY, heat the dish.



Describe what you see on the underside of the glass. Explain where it has come from.

- 2.2 Repeat this experiment with the most sandy soil from your samples. Record your results.

- 2.3 Plants need the water that is in the soil to grow. Discuss how a farmer can reduce the amount of water that evaporates from the soil.



DIFFERENT TYPES OF SOIL

- 2.4 In Seychelles, there are some plants which grow better in sandy soil than in red soil. There are other plants which grow better in red soil than in sandy soil. Find out which soil is better for these plants;

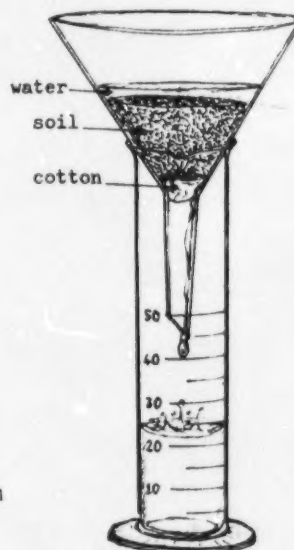
coconut, yam, banana, cassava.

- 2.5 When water falls onto the soil, some of it must pass, or drain, right through the soil. Now we shall do an experiment to compare how much water drains through red soil and sandy soil;

Put a filter funnel on top of a measuring cylinder. Put a small piece of cotton into the funnel. Fill a matchbox with dry sandy soil. (The top of the soil must be level with the top of the matchbox).

Now set up another apparatus in the same way, but use dry red soil instead of sandy soil.

- 2.6 Carefully pour 50ml of water onto the sandy soil in the funnel. Pour another 50ml of water onto the red soil in the other funnel. Leave them both to stand for 5 minutes.



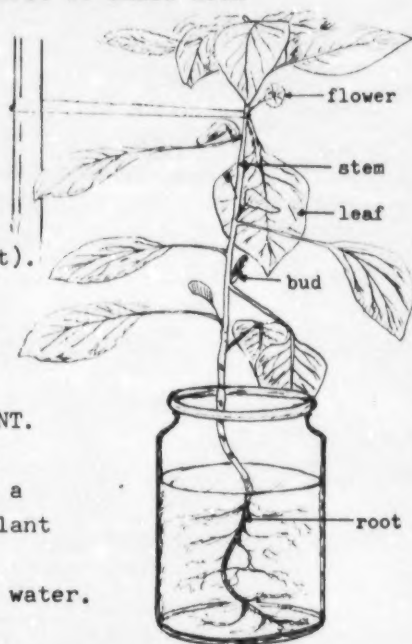
- 2.7 After 5 minutes, record the volume of water that has drained through the sand, and the volume that has drained through the red soil. Discuss which type of soil would hold, or retain, more water after a shower of rain.

LOOKING AT PLANTS

3.0 In Topics 1 and 2, we learnt that there are many things in the soil; air, water, particles of rock and humus. There are also many things that live in or on the soil. In one minute, write down as many things as you can which live in or on the soil. Compare your list with your friends'.

3.1 You have probably written down the names of some animals and plants in your list. We shall learn more about the animals later, but first we shall look more closely at plants.

Use a tool, such as a trowel, to dig around a small plant such as "lerb sat", or balsam. Carefully, lift up the plant. (Use one hand to hold the soil and the lower part of the plant).



3.2 Use water to remove any bits of soil which stick to the plant. BE CAREFUL NOT TO BREAK THE PLANT. Put the lower part of the plant into some water in a jar. Find a way to hold up the top of the plant so that it does not fall over. Put some colour, or dye, in the water.

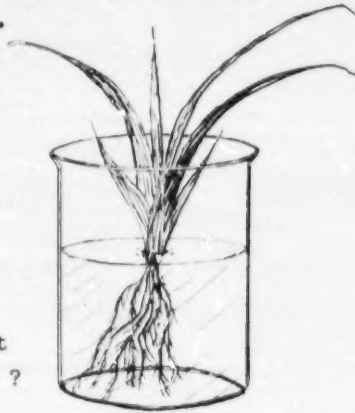
3.3 Use the diagram above to help you find the leaves, stem and roots of the plant. (You may also find some buds and flowers). In your book, make a large drawing of the whole plant, and label it.

LOOKING AT PLANTS

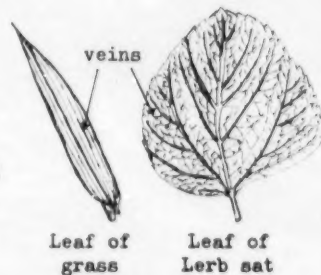
- 3.3 Now use a trowel to dig up some grass plants. Wash the roots carefully with water.

Stand the plants so that their roots are in water in a jar. In your book, make a large drawing of the grass. Label your drawing.

Look at the way the parts are arranged, (the structure), in the grass. How is it different from the structure of lerb sat ?



- 3.4 Now take one leaf from a grass plant, and one from a lerb sat plant. Look carefully at both leaves. Describe any differences you notice between the leaves. Also, write down any ways in which you think the two leaves are like each other, or similar.



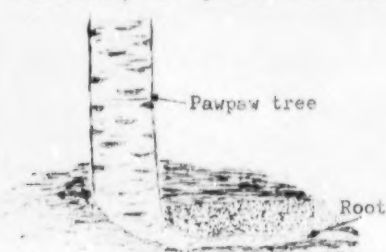
- 3.5 Grass is a type of plant that we call a MONOCOT. Most monocots have narrow leaves with parallel veins, and have roots like strings, or "fibrous" roots. Lerb sat is another type of plant which we call a DICOT. Most dicots have wide leaves, with veins like nets, and one large main root, with smaller side roots.

Look at some of the plants which we grow for food. We call these - crops. For example: tomato, coconut, pepper, sugar cane, mango, maize, breadfruit etc... Which do you think are monocots, and which are dicots ? Give reasons for your choice.

PLANT ROOTS

4.0 In Topic 3, we learnt about some of the different parts of plants. Most plants that we see every day have parts called roots. Now we shall try to find out more about what the roots of a plant do.

4.1 Look at a place where a pawpaw tree is growing. Carefully, take off some of the soil from around the tree until you can see one or two roots. Remove some more soil so that you can follow these roots. Measure how long the roots are, and describe them in your book. Cover the roots again when you have finished, and press the soil back down again.



4.2 Repeat this with a banana plant. Compare the roots of the pawpaw with those of the banana. Suggest why we need to use pieces of wood to stop banana plants falling.

4.3 Find a place outside where grass is growing well. Pull on the leaves of some plants with your hands. Describe what happens.



Do you think the leaves will grow back again ? Why do you say so ? We often need to remove grass, and other plants we do not want (weeds) from the soil. Describe the best way of removing weeds in your book.

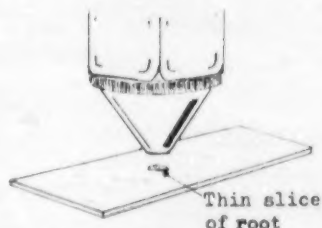
PLANT ROOTS

- 4.4 We have learnt that the roots of a plant hold it in the soil. They help to stop the wind blowing it over. We also know that if we want to remove a weed from the soil, we must remove its roots. If we leave the roots in the soil, then the weed may grow again. Now we shall try to find out how the roots of a plant help it to grow.

- 4.5 In Topic 3.1, you left a plant (herb sat) to stand with its roots in water. We coloured the water red. Can you now see any red colour in the plant? Where?



- 4.6 We can use a microscope to look more closely at the plant. Cut the stem with a knife, or razor. Now cut a very thin piece, or slice, off the root. Put it on a glass slide and look at it through a microscope.



Describe what you see.

- 4.7 Now cut some very thin slices from the stem and from one of the leaves. Look at these through the microscope. Can you also see the red colour in them?

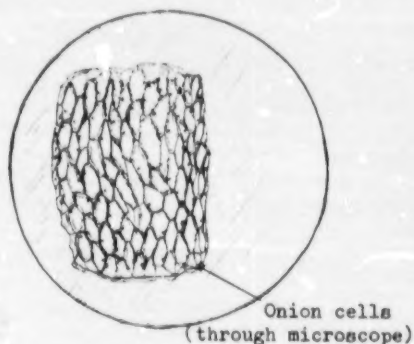
Suggest how the red colour gets into these parts of the plant.

LIVING CELLS

1. All living things are made of very small parts called CELLS. We must use a microscope to look at cells because they are very small. Now we shall look at a part of a plant through a microscope to see what cells look like.

2. Take a small piece of the thin "skin" from a plant such as "onion grass". Look at it through a microscope.

When you have focussed the microscope, you will be able to see the cells, which look like small boxes.



(Your teacher may allow you to adjust the lens knob.

This will help you to look at the cells more closely.)

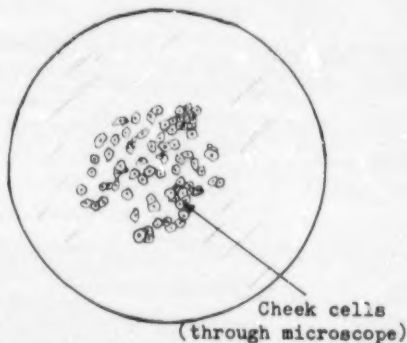
In your book, draw a few cells which you can see clearly.

3. Our own bodies are also made of cells. Let us look at some of our own cells.

Use a clean spatula to scrape some cells from the inside of your cheek. Put the cells on a microscope slide.

(Your teacher will also give you a drop of a special chemical.

If you put this on the cells, it makes them easier to see.)



Describe what your cheek cells look like through the microscope. Are they the same as plant cells ?

LOOKING AT SNAILS

- 5.0 As well as plants, there are many animals that live in or on the soil. We shall study two "soil animals" that are important in agriculture. The first of these animals is the snail.

- 5.1 You should collect a few living snails early in the morning, and leave them with the science technician. Collect some leaves from the plants which the snails were eating when you found them. Put your snails into a large bowl, beaker, jar or basin with some wet leaves.

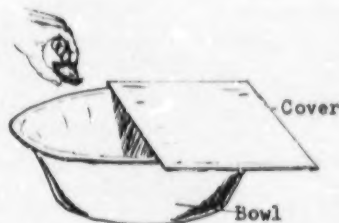


- 5.2 Leave the snails alone for several minutes so that they partly come out of their shells. YOU WILL NEED TO HAVE PATIENCE ! In your book, make a drawing of a snail "out of its shell".

Then write a few lines to say how a snail moves, and how it eats.

- 5.3 We can do an experiment to find out if snails prefer light to shade:

Put a few snails into the middle of a large bowl. Put the bowl in the sun, and cover one half of it with a piece of card.

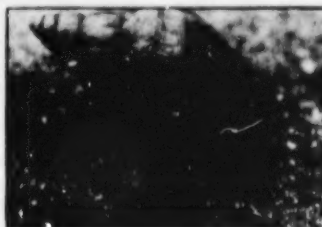


Leave it for 20 minutes, then count the number of snails in the shade and in the sun.

LOOKING AT SNAILS

- 5.4 Snails are important in agriculture because they eat many crops that we plant. We must learn more about snails so that we can control them.

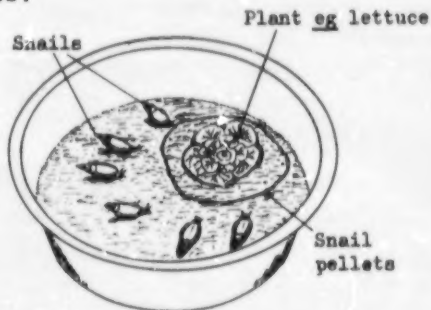
Put some salt in front of a snail that is moving.
Describe what happens as the snail starts to touch the salt.



Do you think it would be a good idea to use salt to protect our crops from snails? Give a reason for your answer.

- 5.5 Normally, we use some special "snail pellets" to help control snails. Let us see if we can find out what happens when we use these pellets:

Set up two basins or bowls.
Put a plant, or some leaves that snails eat, into each bowl. Put snail pellets all around one of the plants, but not the other.
(Snails must not be able to reach the first plant without touching the pellets).



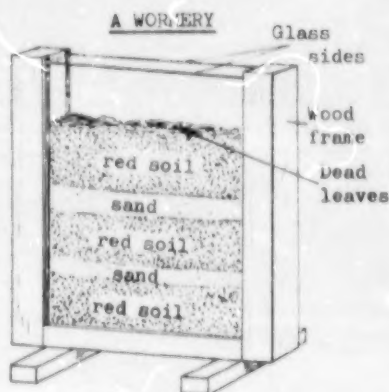
Put several snails into each bowl, and leave them for a few hours, or overnight. You will need to cover the bowls to stop the snails escaping.

Describe what has happened to the snails in the bowl with the pellets.

THE WORMERY

- One of the most important animals that lives in the soil is the earthworm. Earthworms are important because they help to make the soil better for growing crops. Now we shall try to discover more about earthworms.

- We can study earthworms in a special box called a wormery, which has glass sides. Look at the diagram (right). It shows how to fill up a wormery with red soil, sand, and bits of dead leaves, or humus. You should wet the soil in the wormery after you have filled it.



- Collect some earthworms and bring them to school. Put a few of them on top of the dead leaves in the wormery. Then make a drawing of the wormery in your book. Cover the glass sides with card to keep the soil in the dark.

- Leave the wormery for several weeks. Make sure that the soil does not get dry. Every few days lift up the covers and look inside. Write down any changes that you notice on a chart like the one on the right. (You may like to make another drawing of it after a few weeks.)

DATE	OBSERVATIONS

- Discuss how you could find out which food worms prefer.

LOOKING AT EARTHWORMS

- 6.0 Now that we have set up a wormery, we can study the earthworms themselves more closely. Collect a few more lively earthworms, and bring them to school. Be careful not to damage them, and do not let them get dry.

- 6.1 Put a lively earthworm onto a piece of dry paper, and let it move around. Which end do you think is its head? How do you know?



Earthworm

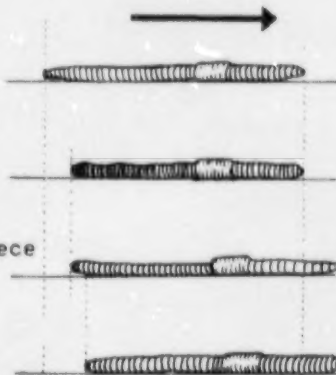
Now turn the worm upside down. Use a hand lens to look at it closely. Describe any differences that you notice between the top and the underside of the worm.

Is it able to turn itself over again?

- 6.2 You may have seen some tiny hairs, or bristles, on the underside of the worm. These help it to hold on to the ground as it moves.

Can you hear the bristles scratching on the paper as the worm moves? You may be able to feel them with your finger tips.

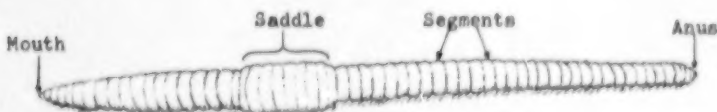
Now put the worm onto a wet piece of paper. Watch it as it moves forward. Try to describe how it moves in your book.



Earthworm moving along

LOOKING AT EARTHWORMS

- 6.3 Now let's look more closely at the body of an earthworm:



The body of an earthworm is made of many similar parts called segments. There is also a wider part, near the middle of its body, called the saddle. It has a mouth near its head, and has an anus at the other end. In your book, make a large drawing of the worm that you are looking at. Label your drawing with the underlined words.

- 6.4 Discuss how you could find out if earthworms prefer light to darkness. Plan an experiment with your friends to find out. Discuss your plan with your teacher, and then do your experiment. Describe what you do, and record the results that you get.



Write down your conclusion (what you have learnt from your results).

<u>INDEX OF NEW WORDS</u>	<u>PAGE NUMBER</u>	<u>INDEX OF NEW WORDS</u>	<u>PAGE NUMBER</u>
Anus	14	Mouth	14
Bristles	13	Particles	2
Buds	5	Retain	4
Cells	9	Roots	5
Clay	2	Saddle	14
Crops	6	Sand	2
Drain	4	Segments	14
Earthworm	12	Silt	2
Flowers	5	Similar	6
Gravel	2	Soil	1
Hand lens	1	Snail	10
Humus	2	Snail pellets	11
Leaves	5	Stem	5
Loam	3	Trowel	5
		Underside	13
		Weeds	7
		Wormery	12

